UNITED STATES OF AMERICA

v.

MICHAEL NOWAK

UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF ILLINOIS

EASTERN DIVISION

CASE NO: 19 CR 669

REPLY DECLARATION OF JEREMY CUSIMANO MAY 22, 2023

ALVAREZ & MARSAL DISPUTES AND INVESTIGATIONS LLC
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I. BACKGROUND

1. Counsel for Michael Nowak asked me to evaluate and respond to Prof. Venkataraman's Reply Declaration ("Venkataraman Reply Decl." or "Reply"), in which he defended the analysis in his primary declaration of December 22, 2022 ("Venkataraman Decl."), arguing that his criteria for identifying alleged spoofing were not overinclusive, that his methodology for calculating loss was sound, and that my approach to calculating loss, articulated in my declaration submitted on April 10, 2023 ("Cusimano Decl."), was unreasonable. But, as I explain below, Prof. Venkataraman's defense of his methodology and criticisms of my proposed loss calculation are flawed, and my calculation is a far more reasonable approximation of potential loss.[1]

II. RESPONSE TO CRITIQUE OF MY ALTERNATIVE CALCULATION OF MARKET LOSS

A. I Disagree with Prof. Venkataraman's Critiques of My Alternative Calculation

i. I Properly Limited My Calculation of Loss to Traders Who Crossed the Spread, Applied a Data-Backed "But-For" Price, and Calculated Rates of Spread-Crossing

2. Prof. Venkataraman asserts that my methodology is flawed because I assessed losses from spread-crossing trades only, used the best price on the opposite side of the market as the but-for price, and included only spread-crossing trades in my rate of spread-crossing.[2] I disagree.
3. I properly limited my calculation of loss to traders who crossed the spread and did not include (as Prof. Venkataraman did) trades resulting from passive market participants improving their bids/offers. As discussed below, it is an error to equate trades by traders crossing the spread after an imbalance occurs and those by traders placing resting limit orders after an imbalance occurs. That error is exacerbated in Prof. Venkataraman's calculations,

[1] This declaration was prepared with the assistance of other professionals at A&M working under my direct supervision. My opinions herein depend solely on work performed through the date of this declaration. I reserve the right to supplement my opinions should further documentation be produced that bears on any of my analyses, and to respond to any other expert opinions proffered by or on behalf of the parties to this matter.
[2] Venkataraman Reply Decl., p. 55.

because my analysis shows that the vast majority of the non-spread-crossing trades Prof. Venkataraman considers in his loss analysis occurred when the impact from Mr. Nowak's alleged spoof orders had already dissipated.

4. As discussed further below, I properly used the best price on the opposite side of the market (e.g., the best offer where the purported victims are buyers) as the but-for price, because that represents the available, executable price at which the purported victims could have traded by crossing the spread, unlike Prof. Venkataraman's but-for price, which is an unavailable price at which he assumes the purported victims wanted to trade.
5. Finally, Prof. Venkataraman's criticism of my spread-crossing rate calculation is invalid. The reliability of the methodology I used to calculate rates of spread-crossing was demonstrated quantitatively and reflects actual rates of spread-crossing (the appropriate metric to assess theoretical loss). By contrast, Prof. Venkataraman chooses to use an artificial definition of "spread-crossing," supported by nothing other than his own opinion. His definition selectively ignores some spread-crossing trades and includes some non-spread-crossing trades, which there is no reason to believe were caused by Mr. Nowak's trading, ultimately to overstate theoretical losses.

ii. I Properly Limited My Assessment of Loss During the Alleged Spoofing Sequences Only to Trades That Occurred When Market Participants Could Be Responding to Imbalances Created by Mr. Nowak's Activity

6. Prof. Venkataraman also contends that I improperly limited the duration for which I measured harm in each sequence—i.e., that I did not begin counting fills early enough and that I ceased counting fills too soon.[3] However, I appropriately limited theoretical losses to time periods during which the supposed victims could have crossed the spread in reaction to a market imbalance purportedly created by Mr. Nowak's alleged spoof orders. I identified those time periods (within 3.2 seconds of the alleged spoof order reaching 30 lots in the top five levels of the order book and within 0.9 seconds of the last order in the scale being

[3] Venkataraman Reply Decl., p. 52.

canceled) with robust data analysis that Prof. Venkataraman has not rebutted.[4] This 30-lot threshold is based on Prof. Venkataraman's own selection criteria.

7. Prof. Venkataraman does not acknowledge the data analysis I performed proving that Mr. Nowak's alleged spoof orders were only capable of eliciting a market response for this short period, nor has he offered any sound rebuttal. Rather, he persists in assessing losses for the entire duration of the alleged spoofing sequences without any supporting data analysis and based only on the theory that limiting the duration *might* exclude some (unproven) losses where the alleged victim did not even cross the spread.
8. Prof. Venkataraman's critique that I did not begin counting fills soon enough is counter to the fundamental assumption that it is a visible order imbalance that is causing market participants to cross the spread and contradicts his own repeated emphasis (including at trial) on market imbalances as the mechanism of harm to market participants under the government's spoofing theory. His criticism is without merit as these fills take place before the alleged spoof orders have reached sufficient visible order depth to elicit any theoretical response. This critique also fails to account for the fact that Mr. Nowak typically placed his scaled orders from worst price to best price, meaning that any market imbalances coinciding with Mr. Nowak's scales *before* they reached 30 lots in the top five levels would occur when many or most of Mr. Nowak's orders were very deep in the order book (e.g., levels six to ten) and therefore extremely unlikely to cause any market impact. Based on my experience analyzing market order books and independent economic research, the diminishing impact of orders placed deeper in the order book is incontrovertible.[5] Nevertheless, Prof. Venkataraman advocates for beginning to assess market harm as soon as Mr. Nowak places a single order deep in the order book, when reason and authority suggest it is likely to have no impact. Beginning to calculate loss when the total visible quantity in the top five levels of the

[4] Cusimano Decl., pp. 34–35. My analysis is also supported by independent academic research. See, Tarun Chordia, T. Clifton Green, and Badrinath Kottimukkalur (2018) Rent Seeking by Low-Latency Traders: Evidence from Trading on Macroeconomic Announcements, *Review of Asset Pricing Studies*, Vol. 31(12), 4650–4687.
[5] Nikolaus Hautsch and Ruihong Huang (2012) The Market Impact of a Limit Order, *Journal of Economic Dynamics and Control*, Vol. 36, 501–522 (orders placed beyond the third level of the order book have a statistically insignificant market impact.). Prof. Venkataraman has likewise confirmed that in his analysis and testimony. For example, see Trial Tr. 2950:17–20 ("For the imbalance I did [focus on the top five levels, not all ten levels] because, as I pointed out earlier, the top five levels is important. So if you look at the imbalance which is two slides away, you would see that I focused on the top five levels.").

order book reaches the 30-lot threshold is a far more reasonable approach that is consistent with established market principles.

9. Furthermore, Prof. Venkataraman criticizes my approach to determining how the market responds to imbalances, claiming that "*even the entry of a small order can initiate an 'order book imbalance' if the book is sufficiently imbalanced prior to the placement of the small order*."[6] Yet Prof. Venkataraman has not asserted that any of the imbalances identified in his alleged spoofing sequences were "small" or otherwise insufficient to elicit a market response—and the results of my broader analysis of market imbalances are *consistent* with the results of my analysis of the alleged spoofing sequences. Moreover, his suggestion that I have disregarded imbalances caused by small orders ignores the discussion in my previous declaration.[7] There are thousands of imbalances included in my analysis, both small and extremely large—in fact I included every imbalance in the market on the days Mr. Nowak traded. The values I used account for small imbalances and smooth out the impacts of outliers. Perhaps more importantly, my analysis of the market response to general order book imbalances is consistent with my analysis of imbalances created by Mr. Nowak's orders during the alleged spoofing sequences, which, presumably, Prof. Venkataraman does not contend are too small to elicit a market response.

III. PROF. VENKATARAMAN'S ATTEMPTS TO DEFEND HIS ANALYSIS ARE FLAWED

10. While Prof. Venkataraman concedes the legitimacy of certain of my (and Dr. Attari's) criticisms and has "updated" his analysis to correct for them, he continues to ignore or fails to meaningfully address other significant flaws described in my Declaration, which, if addressed, would substantially further reduce his loss calculation for Mr. Nowak.

[6] Venkataraman Reply Decl., pp. 52–53.
[7] Cusimano Decl., n. 27, p. 33.

A. Prof. Venkataraman's Flawed Identification of Alleged Spoofing Sequences

i. Prof. Venkataraman Improperly Dismisses the Clear Intent Conveyed by Mr. Nowak's Placement of Aggressive Orders

11. Prof. Venkataraman continues unreasonably to ignore the fact that aggressively placed orders are the clearest possible demonstration of a trader's intent at the time of order placement. Prof. Venkataraman attempts to justify including alleged spoofing sequences in which Mr. Nowak places aggressive orders on both sides of the market, for example the sequence shown in Figure 4 in his Reply, by arguing that "*the Opposite Side Orders generally result in fills. . . while the Spoof Orders generally result in cancelations.*"[8] But Prof. Venkataraman ignores the significance of Mr. Nowak's decision to place aggressive orders (i.e., orders that he wants to trade), and asserts that the later-in-time cancelations override that clear demonstration of intent and somehow definitively indicate spoofing, despite the fact that there are many non-spoofing reasons to cancel orders. His assertion is illogical and is especially problematic in a market like this where over 80% of orders end in cancellation.
12. Additionally, with respect to Figure 3 in his Reply, Prof. Venkataraman seems to suggest (incorrectly) that this sequence was excluded from my analysis.[9] I did not exclude it, because the fills were not aggressive, so it is irrelevant to his criticism here.

ii. Prof. Venkataraman's Statements Regarding Trade Surveillance Practices Are Not Supported by Any Demonstrated Experience or Expertise

13. Prof. Venkataraman disagrees with my assertion that he applied broader screening criteria than would typically be used for standard trade surveillance, and claims that his selection criteria are "*much narrower than standard trade surveillance algorithms, which have broader parameters and fewer criteria*."[10] Prof. Venkataraman has offered no basis in fact or experience for this incorrect opinion, nor has he shown (or even claimed) that he has any expertise in assessing or designing trade surveillance practices in any market, let alone the futures market. In my experience, which is extensive in this area, even off-the-shelf trade

[8] Venkataraman Reply Decl., pp. 10–11.
[9] Venkataraman Reply Decl., pp. 9–10.
[10] Venkataraman Reply Decl., p. 11.

surveillance tools often include at least five to ten different screening methods to screen for different types of spoofing. Each of these typically has approximately ten parameters that can be calibrated to generate customized alerts. In other words, standard trade surveillance tools are far narrower than Prof. Venkataraman's selection criteria, which do not include meaningful order proximity, order book depth, order duration, or cancelation rate criteria, among other relevant metrics that might indicate spoofing.

14. Relatedly, Prof. Venkataraman continues to defend his overbroad selection criteria by conflating them with the "patterns" he observed through post-hoc statistical analysis.[11] Statistical analysis of a selected population is not a substitute for reliable selection parameters, and Prof. Venkataraman has failed ever to acknowledge this fact.

iii. Prof. Venkataraman Provides No Rational Reason for Departing from the Criteria He Used in United States v. Bases

15. Prof. Venkataraman has provided no meaningful justification for deviating from spoofing selection criteria he has endorsed in other cases, and his explanation for the purported inapplicability of the *Bases* criteria is circular.
16. For instance, he does not use the five-second maximum alleged spoof order duration that he used in *Bases* to identify spoofing in this case. He says that five seconds was an appropriate maximum spoof order duration in *Bases* because "*the Spoof Orders typically canceled within five seconds*,"[12] whereas in this case the orders rested for a longer period of time. His assertion is nothing more than a recitation of the duration parameters he (and the DOJ) designed in each case. A more reliable spoofing analysis (like the one I designed) sets a duration parameter (among other parameters), and then assesses the trading using that parameter, among others. Instead, Prof. Venkataraman appears to have first determined what he believes to be spoofing and then designed parameters to fit that belief, which is a deeply flawed and unscientific approach.
17. Additionally, he does not explain why relatively short order duration (even five seconds is not objectively short in the context of this fast-moving market)—a characteristic that is

[11] Venkataraman Reply Decl., pp. 5-6,
[12] Venkataraman Reply Decl., p. 17.

widely acknowledged as a key delineator of potential spoofing, and which he himself asserted at trial and in his statistical analysis is highly relevant—supposedly leads to underinclusive results here.

18. Prof. Venkataraman noted that the selection criteria for each case were based on the evidence presented at each trial, stating he believed it would be improper to adopt the same selection criteria in the two cases when there were different trading patterns presented in each.[13] However, his explanation ignores the fact that all 100 of Mr. Nowak's trial sequences in GX 451 would have had at least one scaled order group flagged had Prof. Venkataraman applied, for example, the *Bases* requirements that alleged spoof orders be placed in the top five levels of the order book and canceled within five seconds of placement.
19. The examples Prof. Venkataraman provided to justify his departure from the *Bases* selection criteria are no more compelling.
20. Prof. Venkataraman argues that the sequence shown in Figure 11 in his Reply illustrates that the selection criteria should capture alleged spoofing sequences where no alleged spoof orders were placed in the top five levels of the order book.[14] He contends the pattern in this sequence (alleged spoof orders placed outside the top five levels, opposite side order partially filled, and alleged spoof orders canceled) was consistent with the evidence presented at trial. This is not the case, as all 100 trial sequences had alleged spoof orders in the top five levels. Setting aside whether this sequence is indicative of spoofing (it is not), little or no market harm could have resulted from it, because the alleged spoof orders were too deep in the order book. As I discussed earlier, this conclusion is supported by peer-reviewed academic research,[15] and such sequences should be excluded from any sound calculation of theoretical market harm.

[13] Venkataraman Reply Decl., pp. 16–17.
[14] Venkataraman Reply Decl., pp. 20–21.
[15] Nikolaus Hautsch and Ruihong Huang (2012) The Market Impact of a Limit Order, *Journal of Economic Dynamics and Control*, Vol. 36, 501–522.

B. Flaws in Prof. Venkataraman's Market Loss Methodologies

i. Prof. Venkatraman Uses Unreliable Control Periods

21. In his Reply, Prof. Venkataraman does not address the substance of my criticisms regarding his control periods. Instead, he argues that "*it is a standard and well-established approach to compare trading patterns before and after an event to measure the impact of an event (i.e., an event study)*."[16] I agree that event studies are well accepted. That is not the issue. The issue is that Prof. Venkataraman's "control period" is not a proper event study. The research Prof. Venkataraman cites in defense of his methodology actually highlights his divergence from accepted event study construction.
22. In the studies cited by Prof. Venkataraman, and others that employ event study frameworks, there is significant discussion of the importance of selecting appropriate control periods. The researchers all specified models to test their varied hypotheses and then evaluated the robustness of results based on different control period samples. They endeavored to capture sufficient market activity to ensure the control periods were representative of conditions outside the event period and not representative of outlier periods.[17] Common practices that are represented in these studies include expanding control periods for durations that are well beyond the duration of the event period, excluding securities that do not demonstrate sufficient liquidity or activity, and limiting analysis to periods where the market is most active.[18] The researchers recognized that without such considerations their models would produce inefficient coefficient estimates and thus prove unreliable.
23. There is an important contrast that can be made between the work described above and that of Prof. Venkataraman. The researchers described above defined hypotheses, specified models to test those hypotheses, and then tested the robustness of their results. Prof. Venkataraman, however, did not pursue any analysis to test his hypothesis. He hypothesized that spread-crossing volume in one direction during the period immediately preceding the

[16] Venkataraman Reply Decl., p. 29.
[17] Imre Karafiath (2009) Detecting cumulative abnormal volume: a comparison of event study methods, *Applied Economics Letters*, 16:8.
[18] Bipin B. Ajinkya and Prem C. Jain (1989) The Behavior of Daily Stock Market Trading Volume, *Journal of Accounting and Economics*, 11, 347-348 (*"*Since we do not have a theory (like the efficient markets hypothesis) to guide us how trading volume should behave around an event, the effective event period may be longer than one day when an event occurs on a single day.").

alleged spoofing sequence should predict (i.e., be the same as) the spread-crossing volume in that direction during the alleged spoofing sequence. That is where his inquiry ended. Under his approach, any observed deviations in spread-crossing are assumed to be in response to alleged spoof orders. As his analysis only comprises observations involving alleged spoof orders, there are no actual control periods. At a minimum, to properly structure an event study, he would have needed to include a large number of matched time periods that do not involve assumed spoofing activity (e.g., periods where the market traded and matched time periods preceding that trading activity). Given the sporadic nature of trading in gold futures on a second-by-second basis, he also likely would have needed to experiment with increasing the duration of the observation windows to capture sufficient market activity to produce robust results.

24. Additionally, the researchers Prof. Venkataraman cites all emphasize limitations in the quality of the data used for their analysis. For example, Barclay, Christie, Harris, Kandel and Schultz selected data only from normal business trading hours to avoid illiquid periods in the market.[19] Prof. Venkataraman employs no similar guardrails to improve the quality of his data. As I noted in my Declaration, three out of every four seconds of trading in the gold futures markets during the relevant period exhibited no trading at all.[20] Prof. Venkataraman does not acknowledge the infrequency of trading and does not consider its impact on his supposed event study. In failing to do so, he is relying on brief periods of market activity that are prone to sporadic trading, often with large volume swings, and attributes any observed changes solely to the alleged spoof orders. Certainly, when the market trades at times outside of the alleged spoofing sequences, it does so for reasons other than the presence of spoof orders (even if those trades were preceded by periods of no trading). However, Prof. Venkataraman does not control for the sparsity of volume in the gold futures market.
25. Similarly, the studies Prof. Venkataraman cites all employ data sampling frequencies that are commonly accepted in event studies. These include daily prices, daily averages, and multi-day periods.[21] By contrast, it is *not* a commonly accepted practice to use short, sparsely

[19] Michael J. Barclay, William G. Christie, Jeffrey H. Harris, Eugene Kandel, and Paul H. Schultz (1999) Effects of Market Reform on the Trading Costs and Depths of Nasdaq Stocks, *The Journal of Finance,* Vol. 54, No 1, 7.
[20] Cusimano Decl., p. 18.
[21] Michael J. Barclay, William G. Christie, Jeffrey H. Harris, Eugene Kandel, and Paul H. Schultz (1999) Effects of Market Reform on the Trading Costs and Depths of Nasdaq Stocks, *The Journal of Finance*, Vol. 54, No 1; Hendrik

traded, intraday periods the way that Prof. Venkataraman has, particularly not when the goal is to predict trading volume (i.e., spread-crossing).[22]

26. Separately, as explained in my Declaration, I disagree with Prof. Venkataraman's decision to adjust the duration of a control period to remove any overlap with a previous alleged spoofing sequence. Prof. Venkataraman claims I ignored that he calculated spread-crossing as a rate per second to account for these scenarios.[23] This was not ignored, as it is in fact a significant problem with his approach: It is not reliable to compare a control period of shorter duration with an alleged spoofing sequence of longer duration. As I demonstrated in my prior declaration, the extreme variability in gold futures trading volume from one second to the next should make clear why shortening control periods is likely to understate control period spread-crossing.[24]

ii. Prof. Venkataraman's Selection of But-For Price Is Flawed

27. Prof. Venkataraman claims that his but-for prices for purposes of measuring loss (i.e., the best price on the same side of the market as the alleged spoof orders at the beginning of an alleged spoofing sequence) are reasonable because alleged victims would have liked to receive them instead of the prices at which they traded. However, he fails to acknowledge that there is no evidence these traders would have or could have received these prices. In contrast, my approach is based on the fact that the only knowable price where market participants could have traded was the prevailing best price opposite the alleged spoof orders prior to their placement (i.e., in the case of a sell-side spoofing sequence, the but-for price

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Bessembinder, (2003) Issues in Assessing Trade Execution Costs, *Journal of Financial Markets*, Vol. 6, No 3; Tavy Ronen and Daniel G. Weaver (1998) The Effect of Tick Size on Volatility, Trader Behavior, and Market Quality*;* Gregory W. Eaton, Paul Irvine, and Tingting Liu (2021) Measuring Institutional Trading Costs and the Implications for Finance Research: The Case of Tick Size Reductions. *Journal of Financial Economics.* Vol. 139.

[22] When using an event study to analyze market volume in Imre Karafiath (2009) Detecting Cumulative Abnormal Volume: A Comparison of Event Study Methods, *Applied Economics Letters, 16:8, 797-802*, the author recognizes the need to use expanded and active time periods both before and after the event being studied to ensure the sample data are robust. To address this need, he only includes in his final analysis sample securities that trade continuously (i.e., non-zero volumes) for 331 consecutive days. 300 of these days are used as his control period. This is in stark contrast to Prof. Venkataraman's analysis where he uses very short intra-day periods with little to no trading activity and then incorrectly claims that they provide for a robust control period.

[23] Venkataraman Reply Decl., n. 56, p. 29.

[24] Cusimano Decl., pp. 28–29.

should be the prevailing best bid price, and vice versa). [25] Prof. Venkataraman contends this is unreasonable with no credible explanation.

28. In his Reply, Prof. Venkataraman offers the novel argument that "reservation prices" support his but-for price. He describes the reservation price for a seller as "*the price at which they are willing to sell*."[26] The analogy does not work. Importantly, though he acknowledges that some purported victims may have had orders resting in the market prior to the alleged spoofing sequences while others did not—and though he concedes that "*it is difficult to know the reservation price*" of those who did not have orders resting—he simply assumes that they all had the same reservation price, i.e., the prevailing best price on the "large" side of the market. Prof. Venkataraman gives us no indication as to what portion of his calculated losses are affected by this unsound assumption, and his conclusions cannot be trusted. For market participants who had orders resting in the market at the time the spoofing sequence started, we know *one* price at which they would have been willing to trade, although this might not represent the minimum or maximum price at which they would have been willing to trade (i.e., reservation price) and is not an appropriate benchmark against which to measure harm. For market participants who did *not* have orders resting in the market, there is no basis from which to assume their "reservation price," nor to assume that it was the best price on the alleged spoof order side of the market.
29. For example, sequence NOWAK_GC_S_1638 (involving alleged spoof orders on the sell side of the market) is the sequence for which Prof. Venkataraman has calculated the largest unadjusted market harm ($48,040) with respect to Mr. Nowak. Yet nearly all of the unadjusted harm for this sequence ($47,450) is associated with a purported victim that did not have any offers resting in the market prior to the placement of the alleged spoof orders, meaning that it certainly could not have traded at the best offer price at that time.

[25] Cusimano Decl., p. 40.
[26] Venkataraman Reply Decl., p. 33.

iii. Prof. Venkataraman's But-For Cost of Trading Methodology Does Not Cure the Flaws in His Methodology for Counting Fills

30. Prof. Venkataraman also claims that I overlooked the nature of his but-for cost of trading adjustment, and that his market loss methodologies address my concern that he did not assess the impact of the alleged spoof orders or the duration of this impact, stating, "[*i*]*f there was indeed no impact of Spoof Orders during the Spoofing Sequences, my methodology would have found no Adjusted Market Loss attributable to the Spoof Orders*."[27] He apparently believes that the assumed price impact in his but-for cost of trading methodology, which he attributed to alleged spoof orders, renders any limitation of the measurement window unnecessary. This assumption is deeply flawed.

31. Importantly, Prof. Venkataraman has never demonstrated that any observed changes in market prices during the alleged spoofing sequences were in fact caused by Mr. Nowak's orders as opposed to other market factors or independent trader decision-making. Financial market theory does not support his assumption that prices during the control period should remain the same in the alleged spoofing sequence. If this were even approximately true, markets would never move randomly and would be easily predicted, which is not the case.[28]

32. Prof. Venkataraman's failure to demonstrate that alleged spoof orders caused prices to move or to quantify that price move is particularly important considering the market activity in his sequences. In 3,609 of Prof. Venkataraman's original 6,063 alleged spoofing sequences involving either Mr. Nowak alone or Mr. Nowak and another defendant each trading individually (59.6%), the market was trading in the same direction both before and during the spoofing sequence.[29] Based on my analysis of his but-for cost of trading methodology, Prof. Venkataraman assessed $5,422,880 of theoretical unadjusted market losses from these sequences without controlling for (a) the factors impacting the market *before* the alleged spoofing sequence (which logically could have continued to cause or amplified trading in the same direction during alleged spoofing sequence) from (b) the assumed impact of the alleged spoof orders. His control period analysis is clearly ill-suited for this purpose. This amounts to

[27] Venkataraman Reply Decl., pp. 35–36.
[28] See for example, Eugene F. Fama (1965) Random Walks in Stock Market Prices, *Financial Analysts Journal*, 21(5): 55-59.
[29] The latter example would include situations where the market doesn't trade or trades at Prof. Venkataraman's but-for price (i.e., the but-for cost of trading is zero).

approximately 67.8% of the original unadjusted market loss that Prof. Venkataraman estimated in his Declaration for sequences involving Mr. Nowak.[30] For 981 (16.2%) of the original 6,063 alleged spoofing sequences involving Mr. Nowak, Prof. Venkataraman estimated negative or zero unadjusted market loss, and 509 of these actually exhibited reversals of the assumed direction of price impact—meaning that the market was trading away from the alleged spoof order side during the control period, and then either did not move or traded toward the alleged spoof order side (against the direction predicted by spoofing theory) during the sequence.

33. Setting aside these fundamental flaws, simple examination of the market activity during Prof. Venkataraman's control periods and alleged spoofing sequences reveals that his assumptions regarding the price impact of alleged spoof orders are flawed. These flaws pervade both of Prof. Venkataraman's adjustment methodologies. In my Declaration, I also highlighted a large number of sequences where the control periods exhibited greater rates of spread-crossing than their corresponding spoofing sequences, which contradicts Prof. Venkataraman's theory of causation and harm.[31]

34. Prof. Venkataraman's methodology does not address the question of how long his assumed market impacts last. Conversely, I have presented an analysis of actual market outcomes that demonstrates the limited duration of any increased rate of spread-crossing in the presence of a market imbalance. As I have discussed and shown, increased rates of spread-crossing dissipate within approximately two to three seconds after an imbalance is initiated.

iv. Prof. Venkataraman's Improper Identification of Spread-Crossing

35. Prof. Venkataraman's spread-crossing methodology relies on comparing "spread-crossing" trades during alleged spoofing sequences to the best quotes prevailing before the sequences. As Dr. Attari and I explained, spread-crossing trades should be identified based on the best quotes at the time of a trade. Prof. Venkataraman claimed in his Reply that both Dr. Attari and I misunderstood his rate of spread-crossing measure because we (purportedly) ignored

[30] $5,422,880 / $8,024,430 = 67.6%
[31] Cusimano Decl. pp. 27–28.

the impact of the alleged spoof orders on bid-ask quotes during an alleged spoofing sequence.[32]

36. I did not misunderstand. Prof. Venkataraman deems trades to be "spread-crossing" only if they are executed at a worse price than his but-for price. This definition is misleading, and, by defining spread-crossing in this way, he completely ignores a large number of fills where market participants crossed the spread from the alleged spoof order side but did so at a price that was better than his but-for price. For example, in a sequence where Prof. Venkataraman has identified an alleged spoof order on the bid side of the market, he ignores trades during the control period that resulted from a market participant crossing the spread to buy if that purchase occurred below his calculated but-for price. Prof. Venkataraman offers no explanation for this, but his approach understates rates of spread-crossing during the control periods and overstates the reasonably possible market harm.

C. Prof. Venkataraman's Revisions to His Original Calculations Are Insufficient

37. In his Reply, Prof. Venkataraman provides revised calculations of his adjusted market loss methodologies, in which he excludes five categories of alleged spoofing sequences in order to address certain criticisms from my Declaration, as well as Dr. Attari's.

38. Prof. Venkataraman claims that revising his calculations results in a very conservative assessment. However, the losses that he attributes to Mr. Nowak's alleged spoofing sequences—including the $2,329,944 alternative adjusted loss under his updated spread-crossing methodology[33]—still suffer from flaws that affected his initial analysis. Table 1 below presents the value of incremental changes to Prof. Venkataraman's alternative adjusted market loss calculation if he had taken appropriate steps to further limit sequences that are inconsistent with spoofing activity and to properly identify and value fills in a more reasonable and reliable manner.[34]

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[32] Venkataraman Reply Decl., pp. 36–37.

[33] Venkataraman Reply Decl., p. 51.

[34] The DOJ did not provide a list of Prof. Venkataraman's revised sequences once he addressed some of the deficiencies in his selection process. However, based on the description of those exclusions, I identified a list of alleged spoofing sequences that should very closely resemble the sequences he has valued. Based on his revised list of sequences, Prof. Venkataraman assessed alternative adjusted market losses for Mr. Nowak of $2,329,944. To test the overlap between his sequences and those that I am continuing to analyze, I applied the methodology he said he was using and identified $2,309,146 of theoretical market losses. These values are sufficiently close ($20,798 apart) to assume that he and I are evaluating largely the same set of sequences.

Table 1 - Impact of Corrections to Prof. Venkataraman's Updated Alternative Adjusted Calculation

Impact of Corrections to Prof. Venkataraman's Updated Alternative Adjusted Calculation		
Correction	**Impact If Applied in Isolation**	**Resulting Loss Amount (Cumulative)**
None (current updated figure)		$2,309,146
1. Excluding sequences involving scales not placed in the top five levels and not canceled in part within five seconds of last order placement (two key *Bases* criteria)	$186,729	$2,122,417
2. Excluding executions of orders resting on the "large" side	$450,572	$1,712,187
3. Excluding executions resulting from two matched spread orders	$141,481	$1,588,147
4. Using executable, opposite-side best price for but-for price	$1,426,680	$820,903
5. Excluding executions beyond the 3.2-second dissipation window after 30-lot threshold on "large" side is reached	$1,444,775	$308,715
Combined impact	**$2,000,431**	**$308,715**

39. If Prof. Venkataraman's calculations here were narrowed by using the order life and order placement depth selection criteria he applied in *Bases*, the purported loss amount attributed to Mr. Nowak under Prof. Venkataraman's updated methodology would be reduced by $186,729, to $2,122,417, if applying no other exclusions.[35]
40. If he had excluded executions of orders resting on the alleged spoof side of the market, which result from aggressive orders placed against the direction predicted by his and the government's theory of spoofing, the purported loss attributed to Mr. Nowak under Prof. Venkataraman's updated methodology would be reduced by $450,572, to $1,858,574, if applying no other exclusions.[36]
41. If he had excluded executions resulting from a spread order being matched with another spread order, which involve the spread market, which is an entirely different market with different prices and volumes and mechanics, the purported loss attributed to Mr. Nowak under Prof. Venkataraman's updated methodology would be reduced by $141,481, to $2,167,665, if applying no other exclusions.[37]

[35] See above Section III. A. iii. and Cusimano Decl. pp. 12–13.
[36] See above Section III. B. iv. and Cusimano Decl., pp. 24-25.
[37] Cusimano Decl., n. 30, p. 37.

42. If he had used executable, data-supported but-for prices, as I apply in my alternative loss calculation, the purported loss attributed to Mr. Nowak under Prof. Venkataraman's updated methodology would be reduced by $1,426,680, to $882,466, if applying no other exclusions.[38]
43. If he had appropriately limited his measurement window to the 3.2-second period over which excess spread-crossing took place, his updated methodology would be reduced by $1,444,775, to $864,371, if applying no other exclusions.[39] [40]
44. Had he implemented all five of these restrictions as listed in Table 1, his updated methodology would have resulted in an estimated loss of $308,715.[41] All of these adjustments to his updated methodology are reasonable in that they eliminate sequences that are not indicative of spoofing activity and limit assessment of theoretical harm to the periods in which it is most probable to have occurred.
45. But even with these five adjustments, Prof. Venkataraman would still be overestimating losses, because his alternative adjusted methodology overestimates the amount of spread-crossing that can reasonably be attributed to the alleged spoof orders. Only the excess portion of spread-crossing trades (i.e., in excess of the expected 50% rate) should be considered in the theoretical loss calculation. As I empirically demonstrated in my Declaration, this represents 16.4%[42] of the fills that take place in the 3.2 seconds after the imbalance threshold is reached in each sequence.[43]
46. Taking Prof. Venkataraman's revised set of alleged spoofing sequences and applying my methodology for the "Alternative Calculation of Theoretical Market Harm" that I presented in my Declaration, I estimate that the theoretical market loss that could be attributed to Mr. Nowak's orders is no more than $52,895.

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[38] See above Section III. B. ii. and Cusimano Decl., p. 40.

[39] Alternatively, if he had limited his measurement window to the period spanning from when the 30-lot imbalance threshold is reached to 0.9 seconds after the last order in the scaled order group was placed, over which excess spread-crossing took place, his updated methodology would be reduced by $1,466,093, to $843,053, applying no other exclusions.

[40] See above Section II. A. ii. and Cusimano Decl., pp. 34–35.

[41] If he measured fills using the 0.9-second methodology (see above, n. 39), this value would be $314,762.

[42] Or, 19.6% of the fills that take place in the 0.9 seconds after the last order in the scaled order group is placed and the imbalance threshold had already been reached.

[43] Cusimano Decl., pp. 42–43.

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Jeremy J. Cusimano

May 22, 2023